INSTRUCTIONS

MODEL CHD
BIOLOGICAL MICROSCOPE

This instruction manual is for use of the Olympus Biological Microscope Model CHD. We recommend you read this manual carefully in order to familiarize yourself fully with the use of your microscope so that you can obtain maximum performance.

OLYMPUS

AX5570

BEFORE USE

Observe the following procedures carefully:

1 Operation

① Since the microscope is a precision instrument, always handle it with care, and avoid **abrupt** motions or impacts.

② Avoid exposure to **direct sunlight, high temperature** and **humidity, dust** and **vibration.**

③ Never direct the sunlight to the microscope mirror while adjusting illumination in order to protect your **eyes** from the sunlight.

④ Only use the **tension adjustment ring** for altering the tension of the coarse adjustment knobs.

⑤ Be careful **not** to soil lens surfaces with dust, fingerprints, etc.

2 Maintenance and Storage

① Use a clean brush or lens tissue paper to clean the lens surfaces. If the lens surfaces are soiled with oil or fingerprints, wipe them off carefully with gauze moistened with a **small** amount of alcohol and ether (3:7) solution, or xylene.

② Do not use organic solutions (e.g. thinner, xylene, ether, alcohol, etc.) to wipe painted surfaces of various components, and especially, plastic parts. When extremely soiled, they should be cleaned with a **neutral** detergent.

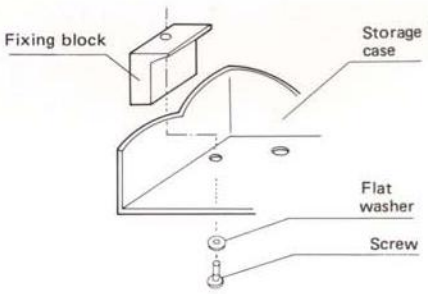
③ Do not disassemble any part of microscope, since the integrated performance may be impaired.

④ When not in use, the microscope should be covered with the dust cover provided or contained in a storage case, and kept in a place free from humidity and mold.

Attaching the fixing blocks of the microscope stand in the wooden storage case (CHD-WB) (optionally available)

The fixing blocks should be screwed at the bottom of the storage case in the following procedure:

1) Insert the screw into a flat washer and one of the two holes (8 mm dia.) in the base plate of the case as illustrated at the right.
2) Tighten the screw to clamp one block by means of the spanner provided.
3) Clamp the other block on the opposite side.



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1 STANDARD EQUIPMENT

Component		CHD-		
		212E	012E	001E
Microscope stand with quadruple revolving nosepiece, square plain stage, including dust plug AA7808, filter 32.5C-2, immersion oil 8cc and dust cover CO11	CHD-F	O	O	O
Monocular observation tube, inclined 45°	CH-M045-W		O	O
Binocular observation tube, inclined 45°	CH-BI45-W	O		
Attachable mechanical stage with right-hand low drive controls	CH-MVR	O	O	
Stage clips, paired	CH-SCBI			O
Condenser, N.A. 1.25	CH2-CD	O	O	O
Filter holder	CH2-FH	O	O	O
Plano-concave mirror	K-MM	O	O	O
E D achromatic objective 4X	ED4X			O
E D achromatic objective 10X	ED10X	O	O	O
E D achromatic objective 40X (spring)	ED40X/R	O	O	O
E D achromatic objective 100X (spring, oil)	ED100X/RO	O	O	
LB eyepiece 10X	CWHK10X		O	O
LB eyepiece 10X (2 pcs.)	CWHK10X	O		

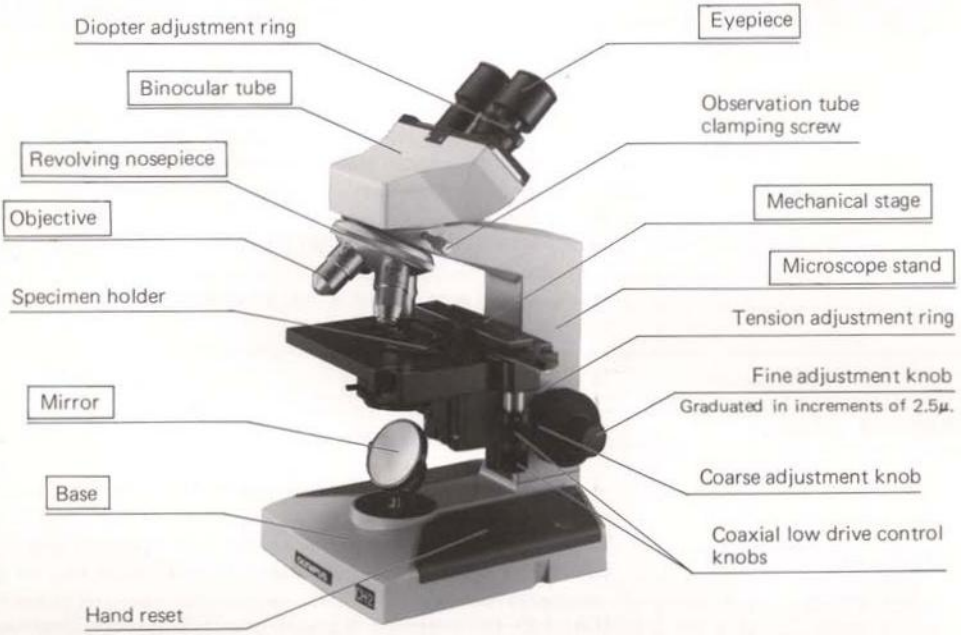
Optional accessories:

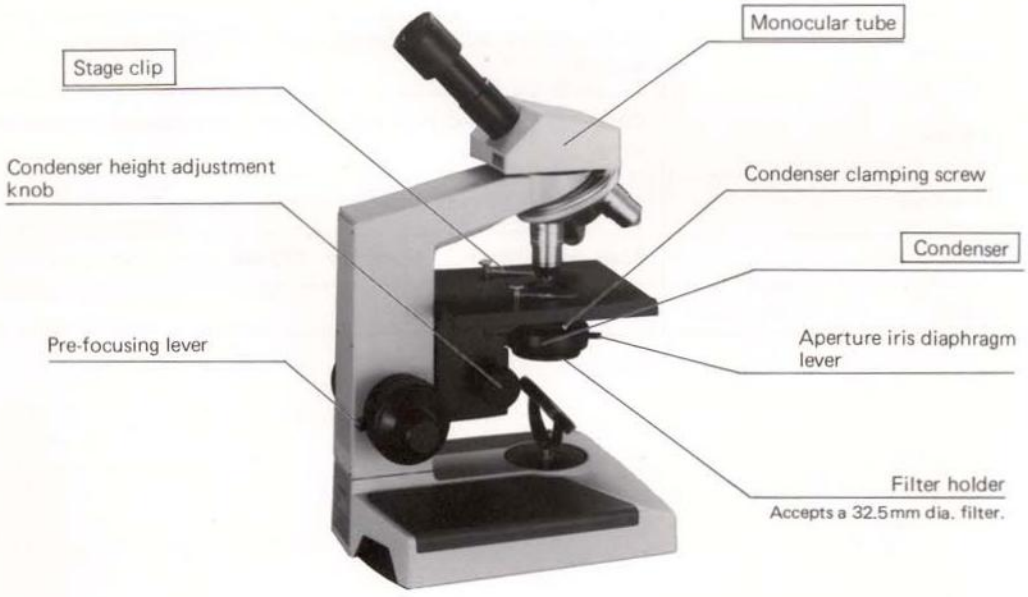
Phase contrast attachment	CH2-PCD-PL
Simple phase contrast attachment	CH2-PC-PL
Vertical illuminator	BH2-KMA
Attachable mechanical stage with left-hand low drive controls	CH-MVL
Sub-stage illuminator	LSK-3
Table stand illuminator	LSD-W
Wooden storage case	CHD-WB

2 SPECIFICATIONS

Item		Description
Microscope stand	Microscope limb	Circular dovetail mount for observation tube; built-on quadruple nosepiece; and square plain stage 124 mm x 153 mm.
	Coarse and fine adjustments	Coaxial coarse and fine focusing controls. Coarse and fine drive range 25 mm; fine drive knobs graduated in increments of 2.5 μ. Tension adjustment knobs, and pre-focusing lever for coarse focusing.
	Condenser holder	Rack and pinion condenser height displacement up to 28 mm.
	Base	Provided with accommodation for attachment of microscope mirror and substage illuminator.
Observation tubes	Monocular	Inclined 45°.
	Binocular	Inclined 45°. Interpupillary distance adjustment with a scale between 53 mm ~ 72 mm. Variable diopter adjustment ring equipped on the left-side eyepiece tube.
Attachable mechanical stage		Low-positioned coaxial control knobs; X-Y traversing area 76 mm x 50 mm, compatible with two standard slides simultaneously.
Condenser		N.A. 1.25 (in immersion oil), with graduated aperture diaphragm. Provision to accept a filter holder.
Filter holder		Accepts a 32.5 mm dia. filter.
Microscope mirror		Plano-concave mirror (50 mm dia.)
Filter		Blue filter (32.5 mm dia.)
Objectives		ED4X, ED10X, ED40X (spring-loaded), ED100X (spring-loaded, oil immersion)
Eyepiece		CWHK10X (provided with accommodation to accept an eyepiece micrometer)
Dimensions		180 mm (W) x 223 mm (D) x 370 mm (H) (binocular version)
Eyepoint height		Binocular: 372 mm Monocular: 375 mm
Weight		CHD-212E: 4.9 kg.

3 NOMENCLATURE

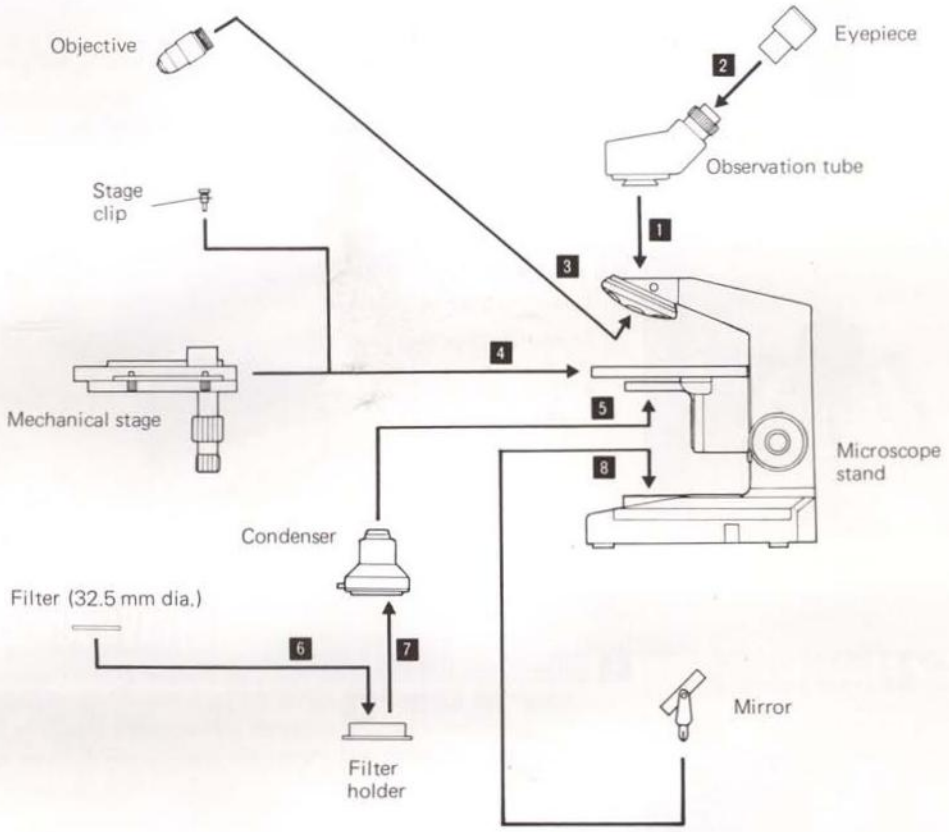




4 ASSEMBLY

4–1 Assembly Diagram

★ Assemble each component in the order of the numbers, taking care to keep all glass surfaces clean and avoid scratching the lens surfaces.



4–2 Explanation for Assembly Procedure

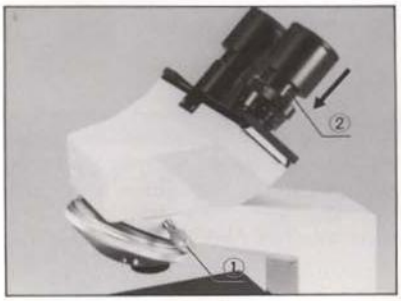


Fig. 1

1 Mounting the observation tube

1) Loosen the clamping screw ① fully, and mount the observation tube on the circular dovetail mount. Reclamp the screw ① to securely hold the observation tube on the stand. (Fig. 1)

2) The observation tube can be normally mounted on the stand with the eyepiece tube(s) pointing backward the microscope so that the observer can look into the eyepiece(s) over the pillar to utilize available light as much as possible; however, the observation tube can be clamped at any direction to the observer preference or convenience.

2 Insertion of the eyepiece(s)

Insert the eyepiece(s) into the eyepiece tube(s) ②. (Fig. 1)

Fig. 2

Use of an eyepiece micrometer

An eyepiece micrometer (10 mm/100) (optionally available) can be inserted into the eyepiece CWHK10X in the following procedure:

1) Remove the retaining ring ① from the lower end of the eyepiece and place the micrometer on the retaining ring with the reticle-engraved surface, facing downward. (Fig. 2)
   ★ **Be certain to clean the micrometer disc before inserting into the eyepiece.**
2) Return the retaining ring into the eyepiece and insert the eyepiece into the eyepiece tube.

Fig. 3

3 Mounting the objectives

1) Lower the stage by means of the coarse adjustment knobs.
2) Screw the objectives into the nosepiece, from low power to higher power in a clockwise direction. (Fig. 3)
   ★ **Close the empty aperture in the nosepiece with a plug ① provided. (Fig. 3)**

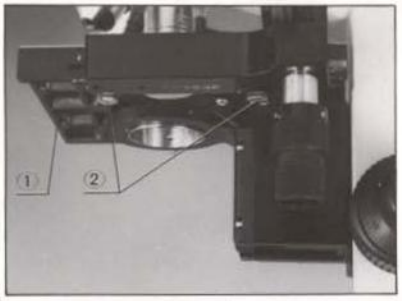


Fig. 4

4 Mounting the mechanical stage

Mount the mechanical stage on the plain stage ① in a manner that the specimen traversing guide of the mechanical stage is located closest to the pillar, and tighten the stage clamping screws ② with a coin. (Fig. 4)

- Insertion of stage clips

The plain stage is pre-drilled for insertion of the stage clips when the mechanical stage is not attached (see page 4).

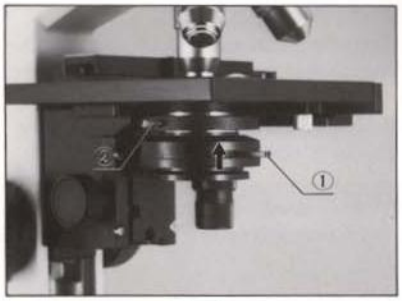


Fig. 5

5 Mounting the condenser

Insert the condenser into the condenser holder, with the condenser iris diaphragm lever ①, directing in the microscope front, and tighten the clamping screw ②. (Fig. 5)

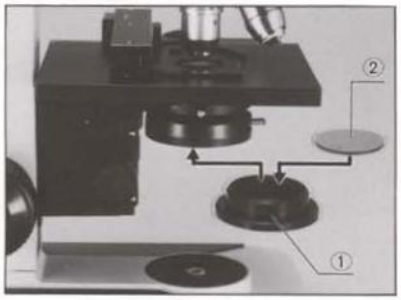


Fig. 6

6 Insertion of the blue filter

Slip the blue filter (32.5mm dia.) ② into the filter holder ①. (Fig. 6)

7 Insertion of the filter holder

Insert the filter holder ① into the condenser from below. (Fig. 6)

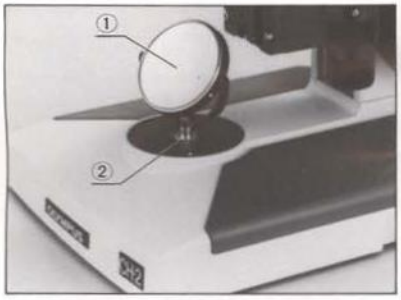


Fig. 7

8 Mounting the mirror

1) Insert the mirror ① fork into the mirror mounting seat ② in the base.
2) If the mirror fork is loose, pull out the mirror fork, and adjust the slit in the fork with a screwdriver.

5 OBSERVATION (Putting the Microscope in Operation)

Fig. 8

1 Specimen Placement

1) Open the spring-loaded specimen finger ①, and slide the specimen slide into the holder, with the cover glass upward.
Push the slide all the way against the holder and release the finger ① slowly. (Fig. 8)
★ **A sudden release of the finger may cause damage to the slide or the holder.**
2) For use of the stage clips in place of the specimen holder, insert a pair of stage clips into the holes on the drilled surface of the stage and insert the specimen slide between each clip and the stage surface.

- Use of a cover glass

  Use a cover glass of 0.17 mm thick in conjunction with the objectives marked with the inscription "160/0.17" for optimum performance of these objectives.

- Use of a specimen slide

  The thickness of a specimen slide between 0.9 mm and 1.2 mm is recommended for the CHD. If the thickness of a slide exceeds this range, illumination may sometimes be impaired.

Fig. 9

2 Adjustment of the Microscope Mirror

1) Install the microscope near the window or place a lamp stand ① in front of the microscope. (Fig. 9)

Fig. 10

2) Looking through the observation tube, adjust the mirror angle and direction so that the field of view is evenly illuminated. (Fig. 10)

3) The flat surface of the mirror is usually employed, unless the objective is very low power. However, if the field of view is not evenly illuminated, use the concave surface.

4) For observation with the available light from the window or from the fluorescent lamp in the room, remove the blue filter from the condenser.

5) For observation with incandescent light, use the blue filter.

Fig. 11

3 Focus

1) Swing in the 10X objective.

2) Bring the specimen into focus by means of the focus adjustment knobs.

★ **Rotate the focus adjustment knobs clockwise (in the direction of the arrow in Fig. 11), to raise the stage (or the specimen approaches to the objective), or reverse the knobs to lower the stage.**

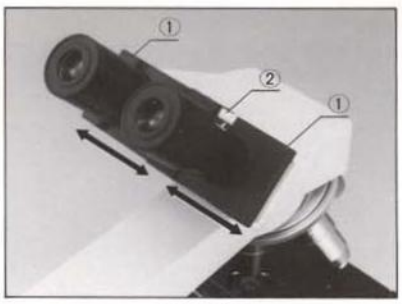


Fig. 12

4 Interpupillary Distance Adjustment (for the binocular tube)

1) Looking through the binocular tube, move the knurled dovetail slides ① in the directions of the arrows until a perfect binocular vision is obtained. (Fig. 12)

2) If you memorize your interpupillary distance setting on the scale ② provided on the dovetail slide ①, it is convenient to obtain a proper setting next time. (Fig. 12)

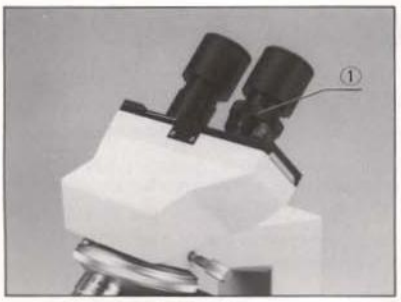


Fig. 13

5 Diopter Adjustment (for the binocular tube)

1) Look at the image through the right eyepiece with your right eye, and focus on the specimen with the focus adjustment knobs.

2) Next, looking at the image through the left eyepiece with your left eye, rotate the diopter adjustment ring ① to focus on the specimen without using the focus adjustment knobs. (Fig. 13)

Fig. 14

6 Objective Selection

1) Swing in the objective to use. (Fig. 14)

2) Be certain to click the nosepiece in position.

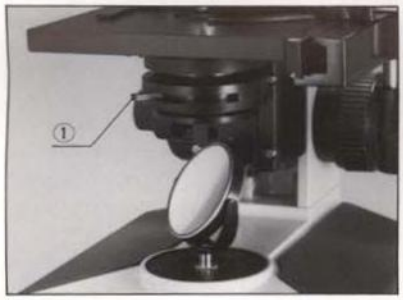


Fig. 15

7 Adjustment of the Aperture Iris Diaphragm

The opening of the aperture iris diaphragm built in the condenser can be adjusted to match with the numerical aperture of the objective in use, in order to achieve optimum objective performance such as depth of focus, image contrast and resolution.

1) Turning the diaphragm lever ① counterclockwise reduces the diaphragm opening. (Fig. 15)

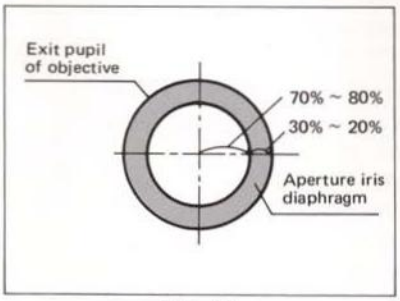


Fig. 16

2) Remove the eyepiece, and looking at the exit pupil of the objective through the empty eyepiece tube, adjust the opening of the diaphragm. Generally, it is preferable to stop down the aperture diaphragm to 70% to 80% of the objective N.A. (Fig. 16)
If the specimen is lightly stained, or almost colorless and transparent, further reduce the diaphragm opening to increase contrast for better observation. Be careful, however, if the diaphragm is stopped down too much, the resolution will deteriorate.

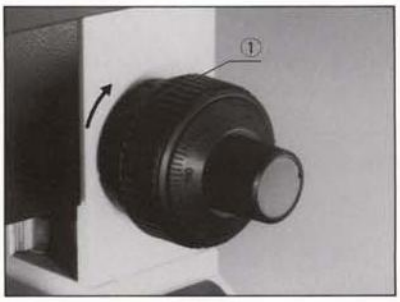


Fig. 17

8 Tension Adjustment of the Coarse Adjustment Knobs

1) A tension adjustment ring ① is provided next to the coarse adjustment knob. With this device the tension of the coarse adjustment is freely adjustable for either heavy or light movement, depending upon operator preference.
Applying the blade of a large screwdriver at the knurled periphery of the tension adjustment ring ①, rotate the ring in the direction of the arrow to increase the tension, or reverse the ring to loosen. (Fig. 17)

2) However, do not loosen the tension adjustment ring too much, because this may cause the stage to drop or the fine adjustment knobs to slip.

Fig. 18

9 Locking of the Pre-focusing Lever

The lever ① is provided to prevent possible contact between specimen and objective as well as to simplify coarse focusing. The lever is locked, turning it in the direction of the arrow in Fig. 18, after coarse focus has been accomplished. This is convenient for liquid application or change of specimens, too, since it prevents further upward travel of the stage by means of the coarse adjustment knobs, and provides a limiting stop if the stage is lowered and then raised again. The pre-focusing lever does not restrict fine focusing.

★ **Unlock this lever when not in use.**

10 Use of Immersion Objectives

1) To utilize the full numerical aperture of an immersion objective (with inscription "oil"), the objective and specimen are immersed in an immersion oil in a following manner:
2) Focus on the specimen with a low power objective.
3) Put a drop of immersion oil on the specimen slide and the front lens of the immersion objective.
4) Turn the nosepiece to bring the immersion objective into the light path, and focus with the fine adjustment knobs.

★ **Use of the pre-focusing lever facilitates steps 2) ~ 4) above.**

★ **Care should be taken to prevent oil bubble from forming in the oil film; if any, swing the nosepiece to the right and left reciprocally several times and re-apply immersion oil, since these bubbles greatly deteriorate the lens performance.**

★ **Be careful not to stain other objectives with immersion oil, and after use, carefully wipe off the immersion oil on the objective, etc. completely.**

6 OPTICAL DATA

Objective / Eyepiece	Type	E D Achromat			
	Magnification	4X	10X	40X	100X*
	N.A.	0.10	0.25	0.65	1.25
	W.D. (mm)	29.00	6.30	0.53	0.20
	Focal length (mm)	31.05	16.45	4.59	1.90
	Resolving power (μ)**	3.4	1.3	0.52	0.26
	Remarks			Spring-loaded	
CWHK10X (Field number 18)	Total magnification	40X	100X	400X	1000X
	Focal depth (μ)	172.5	27.60	3.03	0.67
	Field of view (mm)	4.5	1.8	0.45	0.18

*Immersion objective

**The resolving power is obtained with the fully opened aperture diaphragm.

Glossary:

Working distance:	The distance from the specimen or cover glass to the nearest point of the objective.
Numerical aperture:	The N.A. represents a performance number which could be compared to the relative aperture (f-number) of a camera lens. The quantity of light which the objective receives from the object increases with the square of the performance number.
Resolving power:	The resolving power of a lens is measured by its ability to separate two points.
Focal depth:	The distance between the upper and lower limits of sharpness in the image formed by an optical system. As you stop down the aperture iris diaphragm, the focal depth becomes deeper. The larger the N.A. of the objective the shallower the focal depth.
Field number:	A number that represents the diameter in mm of the image of the field diaphragm that is formed by lens in front of it.
Field-of-view diameter:	The actual size of the field of view in mm.
Total magnification:	Objective magnfication x Eyepiece magnification.

7 TROUBLE SHOOTING

If you are unable to obtain full performance from your microscope because of your unfamiliarity with the microscope, please consult with the table below as pointers for troubleshooting:

Trouble	Cause	Remedy
1. Optical system		
a) Field of view is cut off, or illuminated irregularly.	Nosepiece is not clicked into place.	Slightly rotate the nosepiece until it clicks into position. (p. 8)
	Condenser is not correctly mounted on the ring mount.	Re-insert the condenser all the way. (p. 5)
	Mirror is not properly adjusted.	Adjust the mirror correctly. (p. 7)
		Use the concave side.
b) Dust or dirt is visible in the field of view.	Dust or dirt on the mirror surface.	Remove dust or dirt.
	Dust on the condenser top lens.	
	Dirty specimen.	
	Dust on eyepiece.	
c) Excessive image contrast.	Condenser is lowered too much.	Raise the condenser.
	Aperture iris diaphragm is stopped down too much.	Open the diaphragm. (p. 8)
d) Resolution problems: • Image is not sharp. • Insufficient contrast. • Image details lack definition.	Objective is not correctly engaged in the light path.	Slightly rotate the nosepiece until it clicks into position. (p. 8)
	Dirt on the objective front lens.	Clean the objective.
	Immersion objective is used without immersion oil.	Apply immersion oil. (p. 10)
	Bubbles in the immersion oil.	Remove bubbles. (p. 10)
	Olympus immersion oil is not used.	Use Olympus immersion oil.
	Dirty specimen.	Clean.
	Dust on eyepiece or condenser top lens.	
e) Field of view is partially out of focus.	Objective is not correctly positioned in the light path.	Slightly rotate the nosepiece until it clicks into position.
	Specimen is not correctly placed on the stage.	Place the specimen on the stage and secure it with the specimen holder or stage clips.
f) Image is tinted yellowish.	Incandescent light is used without blue filter.	Use blue filter. (p. 7)
g) Image is tinted bluish.	Blue filter is used with natural light or fluorescent light.	Disengage blue filter. (p. 7)

Trouble	Cause	Remedy
2. Focus adjustment mechanism		
a) Coarse adjustment knobs are too tight.	Tension adjustment ring is tightened too much.	Loosen the tension adjustment ring slightly. (p. 9)
	User is trying to raise the stage, passing over the upper focusing limit imposed by the engaged pre-focusing lever.	Unlock the pre-focusing lever. (p. 9)
b) Stage drops and the specimen goes out of focus.	Tension adjustment ring is too loose.	Tighten the ring properly. (p. 9)
c) Stage cannot be raised to the upper limit.	Pre-focusing lever is engaged in lower than focusing position.	Unlock the lever. (p. 9)
d) Stage cannot be lowered to the lower limit of the working range.	Substage is lowered too much.	Raise the substage.
e) Objective front lens touches the specimen.	Specimen is mounted on the stage upside down.	Reverse the specimen. (p. 6)
3. Binocular tube		
Incomplete binocular vision.	Interpupillary distance is not correctly adjusted.	Correct the interpupillary distance. (p. 7)
	Diopter adjustment is incomplete.	Complete the diopter adjustment. (p. 7)
	Right and left eyepieces are not matched.	Use a pair of matched eyepieces.
	User is unaccustomed to binocular vision.	Prior to looking at the image of the specimen, try to look at the entire field of view, or look at a far away object before resuming microscopic observation.
4. Stage		
a) Image easily goes out of focus when you touch the stage.	Stage clamping knobs are not tightened.	Tighten the stage clamping screws with a coil. (p. 5)
b) Image blurs as you move the specimen.	Specimen is not correctly positioned on the stage.	Place the specimen on the stage correctly. (p. 6)
5. Objective change		
When objectives are changed, the front lens of the high power objective touches the specimen.	Specimen is mounted on the stage upside down.	Reverse the specimen. (p. 6)
	Cover glass is too thick.	Use a 0.17mm-thick cover glass.

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Printed in Japan 8607 M 30×2